

Upper Mississippi River Nine-Foot Channel Project,  
Lock and Dam Number 3  
Red Wing, Minnesota, vicinity  
Goodhue County, Minnesota  
Pierce County, Wisconsin

HAER No. MN-21

HAER  
MINN,  
25-REW.V,  
2-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record  
National Park Service  
Department of the Interior  
Rocky Mountain Regional Office  
P.O. Box 25287  
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD

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Location: On the Mississippi River on the Minnesota side, approximately six miles upstream from Red Wing, Minnesota, about 56.1 miles from the Northern Pacific Railway Bridge at Minneapolis, Minnesota, in Goodhue County, Minnesota, and Pierce County, Wisconsin.

The old river channel at this point measured about 600 feet at normal stage. Floodwaters increased the width to 2-1/2 miles at times. To the right of the river, bottomlands extended to a high bluff for a distance of 6,500 feet at the time of construction. To the river's left, the bottomlands extended to a bluff and high plateau. Lowland areas are covered with heavy timber. See Corps drawings 3-10-2, 10-18, 38-10. See also HAER photographs number MN-21-1 through MN-21-98.

Dates of Erection: 1935-1940

Architect/Engineer: U. S. Army Corps of Engineers

Present Owner: United States Government  
U. S. Army Corps of Engineers  
St. Paul District

Present Use: River navigation/hydrology control

Significance: The Upper Mississippi River Lock and Dam Project represents one of the largest and most ambitious of such undertakings. With root in the Progressive Era, the project was adopted by New Deal proponents to serve the needs of public employment during the Great Depression. Its successful completion turned the upper reaches of one of the world's largest rivers into a intra-continental canal and settled the question of a fully navigable interior river system through the Midwest. Completion of the system helped allay economic inequities in commercial rail and water freight rates brought about as a result of the opening of the Panama Canal. Although significantly altering the environment of the upper Mississippi, the project also served as an impetus for the upgrading of municipal drinking water and sewage disposal systems,

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as well as providing new recreational opportunities,  
thus, in the end, proving generally beneficial to  
public welfare.

Historian: William Patrick O'Brien  
October 1987

For a complete history, footnotes and bibliography, see HAER No. MN-20.

### LOCKS AND DAMS 3 THROUGH 10--INDIVIDUAL SIGNIFICANCE AND INVENTORIES

The following outlines document specific significant technologies reflected in the construction of the individual lock and dam complexes, calling attention to unique engineering design items. Changes made to various systems since their initial completion are also a part of this section. A number of maintenance changes have occurred at various times since their completion. Changes made before 1970 are not well documented; many were superficial. Complete documentation to system changes is contained in the monthly condition reports filed with the St. Paul District Office by the various installations. Some changes may have been made over the years without benefit of documentation. Therefore, the following tables should not be interpreted as entirely inclusive.

It should be noted that architectural and engineering components vary significantly from site to site. Architectural styles for gate pier design fall into two categories: those completed prior to 1935-1936 (1a, 1b) and those completed after those dates (2a 2b). Only one 1a structure exists in the entire Nine-Foot Channel system and is located at Rock Island, Illinois. As such, it is not part of this study. The 1b structures are characterized by large, multipane windows, hip roofs, and engaged buttress detailing on the gate house piers. The 2a structures are more streamlined in style with slit, three-pane windows, flat roofs, and no buttress detail. The 2b structures are identical to 2a elements except for addition of a metal panel in the Roller gate track section of the gate piers that does not occur in 2a structures. Only 1b and 2a architectural types occur in the St. Paul District. Other elements such as central control stations, lockkeepers' residences, and associated structures are standardized, unless otherwise noted.

Dates for the construction of each complex are given from the beginning of initial work to the end of the project and do not necessarily reflect the construction dates of any single element. Complete construction histories for each complex containing exhaustive documentation for the building of the lock, dam, esplanade features, and other attendant installations are on file with

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the St. Paul District Office. These histories contain comprehensive listings for all general contractors and subcontractors involved in the project, as well as a listing for all material suppliers. For the purposes of this study, information regarding contractors and subcontractors has been reproduced as it appears in the construction histories. As a result, certain inconsistencies appear as a matter of course. For example, in some histories the contractor's business location is cited by city. In others, this information is not included. In addition, approximately 10,000 separate construction drawings and illustrations were produced during this project and during the course of maintenance since its completion. Drawings were selected from among these materials to illustrate both standardized elements as well as those pertaining to specific sites. Drawing numbers are noted at the end of entries where applicable. "(" indicates standardized elements illustrated elsewhere in the system. "\*" indicates elements for which drawings are not readily available. General index sheets have also been reproduced at the beginning of each lock and dam illustration collection for a complete reference. Contemporary photographic documentation including 16mm film footage served to document the project. Photographs are on file in the St. Paul District Office and at each individual installation. Sixteen millimeter film footage is available in video cassette format from the St. Paul Office.

Dimensions for the movable gate sections are given in approximate figures, based on the general notations as found in official Corps publications. For example, Roller gates are generally cited as being standardized as either 60 by 20 feet or 80 by 20 feet. However, in the construction history notations, gate lengths are often given exactly as 88 feet 10-1/2 inches long and 15 feet in diameter. Similar approximations apply to information concerning Tainter gate elements. Measurements in both instances should be taken only as approximations for use in categorizing the various sizes and styles of installations and not as an exact measure per se.

## PART I. HISTORICAL INFORMATION

### A. Physical History:

1. Dates of Erection: 1935-1940
2. Architect/Engineer: U. S. Army Corps of Engineers
3. Original and Subsequent Owners: United States Government
4. Builders, Contractors, Suppliers:
  - a. General contractors--lock construction:

Spencer, White and Prentis, New York, New York.

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b. Subcontractors--lock construction:

LaCrosse Dredging Company, LaCrosse, Wisconsin  
Ferd J. Robers, Burlington, Wisconsin

c. General contractors--dam construction:

A. Guthrie Company, St. Paul, Minnesota  
Hallett Construction Company, Crosby, Minnesota

d. Subcontractors--dam construction:

J. E. Donlin Company, St. Paul, Minnesota (steel bearing test  
piles/steel pile protection fin)  
Ferd J. Robers, Burlington, Wisconsin (cofferdam fill and  
embankment)  
C. C. Putnam, Bellevue, Iowa (cofferdam protection/protection  
stone for permanent work and riprap on Dike "A")  
Moretrench Corporation, Rockaway, New Jersey (initial maintenance  
and unwatering of cofferdam)  
Lakeside Bridge and Steel Company, Milwaukee, Wisconsin (delivery  
and erection of Roller gates, service bridge, operating  
machinery, and storage yard steel)  
Commonwealth Electric Company, St. Paul, Minnesota (conduit for  
dam and heater units)  
Scribner Libbey, St. Paul, Minnesota (placing of roofing material  
material on storage yard house and operating houses)  
Atonsen and Space, Red Wing, Minnesota (delivery of all concrete  
and grout from mixing plant to location to be placed)  
A. Anderson Trucking Company, Red Wing, Minnesota (trucking  
backfill material)  
H. Knudson and Company, Chicago, Illinois (painting metal work)  
Independent Bridge Company, Neville Island, Pennsylvania (gate  
construction)

5. Original Plans and Construction: U. S. Army Corps of Engineers

6. Alterations and Additions

	<u>Item</u>	<u>Year</u>
	Repaint Roller gates	
1948	Access road reconditioning	1949
	Lock wall repair--tow damage	1951
	Miter gate leaf no. 2--repair	1953
	Protection dike construction	1953

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Miter gate leaf no. 2--repair	1955
Upper stage recorder house--repair	1956-57
Miter gate leaf no. 2--repair	1957
Cathodic protection material	1957
Traveling mooring bit assemblies	1959
Structural steel Miter gate--repair	1961
Miter gate anchor bar assembly	1962
Recondition main lock (unwater)	1961-62
Repaint Roller gates	1963
Resurface esplanade road	1963
Tree and brush clearing--left bank	1964
200-pound rock stockpile protection dike	1964
Recondition gravel access road	1964
Bubbler system upper gauge replacement	1967
Locomotive gas engine replacement	1968
Rubber seals--Roller gates	1968
Miter leaf gate no. 2--repair	1968
Steel repair--Roller gates	1968
Central control station--reroofing	1969
Construction--comfort station	1970
Construction--observation platform	1970-71
Miscellaneous roofing	1972-73
Access road raised and paved	1973-74
Two mooring cells upstream of lock	1973
Construction--visitor facilities	1974
Scour repair--upstream and downstream of lock	1980
Dewater and recondition lock	1980-81
Replace locomotive crane	1981
Replace rock on spot dike "D"	1983
Scour repair--for consistency with other locks and dams	1983-84

## B. Historical Context

Lock and Dam Number 3 was not an urgent consideration within the context of the Nine-Foot Channel Project. The installation was in the Group B of complexes to be finished. Scheduled as the eighth complex due to be completed, it was actually completed last. Specific items of engineering significance involved the exclusive use of submersible 5-foot Roller gates in the construction of the movable dam, the use of "Z" sheet piling in the construction of the abutment walls, and the replacement of all dam substrata. Prior to construction, approximately 200,000 cubic yards of unstable substrata were replaced with 130,000 cubic yards of river sand. The lock and dam, including dike "A", were completed in 1937 and 1938 respectively. Improvements on the Hastings Island Road, construction of the lockkeeper's dwellings, and construction of the garage were not completed until 1940. The design of the movable dam was the only one in the Nine-Foot Channel Project to solely employ Roller gates as a method of river flow regulation.

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The dam system consists of four Roller gates 80 feet in width and 20 feet high above the concrete. Each gate has its own independent hoist machinery housed in installations above each gate. The gates and operating machinery were constructed and delivered to the site by the Lakeside Bridge and Steel Company of Milwaukee, Wisconsin. Foundations for Lock Number 3 are set in sand, silt, and clay. Foundations for Dam Number 3 are set in sand.

Lock dimensions are the standard 110 by 600 feet, with an additional gate and footings for an auxiliary lock of standard dimensions. Lock lift is eight feet. Upper normal pool elevation is 675 feet; lower pool elevation is 667 feet. Depth on upper Miter sill is 17 feet; lower Miter sill is 14 feet.

Fifty-three injuries took place during the course of the work. No fatalities occurred. The lock and dam elements of the complex took 2-1/2 years to complete, at a cost of \$3,730,000. The complex was opened to navigation in 1938.

## **PART II. TECHNOLOGICAL INFORMATION--LOCK**

### **A. General Statement**

1. Architectural character: standardized Ohio-Mississippi lock design. Drawing number 3-20-1.
2. Condition of fabric: good.

### **B. Description of General Layout and Principal Elements:**

1. Overall dimensions: 110 by 600 feet. Drawing number 3-20-1.
2. Foundations: wood and steel sheet pilings in clay and sand. Drawing number 3-20-2A.
3. Walls: reinforced monolithic concrete. Drawing number (30-20-0A).
4. Structural system: see above.
5. Bulkheads: concrete bulkhead configurations occur at each end of the riverside lock wall. Drawing number (3-20-0A).
6. Upper and lower guide walls: monolithic reinforced concrete walls extending out from the lock chamber at either end to assist in the guiding of barge traffic into the lock. Drawing number (3-20-0A).
7. Stage recorder: small concrete housing located at the end of the lock guide wall. Equipment housed for the recording of river stages. Drawing number (3-77-1).

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C. Mechanical Equipment

1. Operating house: controls for lock gates and Tainter valves housed in small buildings on lockwall. Drawing number 3-41-1.
2. Tainter valves: cable-drive lock valve of steel construction with electric-motorized assembly. Drawing number (3-25-1).
3. Gates: two Miter gates balanced on stainless steel pintels operated by gear arm system and electric motor assemblies. Bumper lines on interior of lock also of stainless steel. All other associated metal parts are of steel, stainless steel, or steel/nickel alloy. Drawing numbers (3-20-0A), 3-21-17, 3-21-19, 3-21-24, and (3-22-1).
4. Lighting: various freestanding single and double head lighting standards, ca. 1935.
5. Plumbing: lock is watered by four cable-drive Tainter valves serving a system of cast-in-place tunnels that enable the water level to be controlled on the interior of the lock.\*
6. Winch: motorized assembly to assist towing of barges through lockage.

D. Other Elements:

1. Auxiliary lock: fixed Miter gate without machinery and with partial walls located to the riverward side of the lock complex. Equipped with wells for machinery placement. Never completed or put into service.\*

PART III. TECHNOLOGICAL INFORMATION--MOVABLE DAM

A. General Statement:

1. Architectural character: type 2a Roller gate piers have large beveled corners and are elephantine in nature. Drawing number 3-40-1.
2. Condition of fabric: excellent.

B. Description of Exterior:

1. Overall dimensions: 365 feet in length. Drawing number 3-40-1.
2. Foundations: artificially placed substrate with wood and steel sheet pilings. Drawing numbers 3-40-4 and 3-40-9.



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3. Operating house walls: monolithic reinforced concrete. Drawing number 3-41-1.
4. Structural system: monolithic concrete/structural steel. Drawing number 3-41-2.
5. Bulkheads: concrete bulkheads located at the base of each Roller gate pier. Drawing number 3-40-1.
6. Operating house openings: two doorways and 13 three-pane slit windows for each Roller gate operating house.
  - a. Doorways and doors: 11. Drawing numbers (3-41-1 and 3-41-2).
  - b. Windows: 65. Drawing numbers (3-41-1 and 3-41-2).
7. Operating house roof:
  - a. Shape, covering: flat roof covered in membrane/tar composition. Drawing numbers (3-41-1 and 3-41-2).
  - b. Towers, piers: five Roller gate piers and operating house towers; one access tower. Drawing number 3-40-1 and 3-41-1.
8. Access bridges:
  - a. Shape: arched spans in a segmental series.
  - b. Materials: structural steel. Drawing number (3-53-1).

C. Description of General Layout and Principal Elements:

1. Access plans: plan of access consists of a simple stairway to the initial pier operating house, each installation being connected by an access bridge/rail track in a linear series. Drawing numbers (3-40-1 and 3-40-2).
2. Stairways: reinforced concrete with pipe railing. Drawing numbers (3-41-1 and 3-41-2).
3. Flooring: reinforced concrete. Drawing numbers (3-41-1 and 3-41-2).
4. Wall and ceiling finish: reinforced concrete. Drawing numbers (3-41-1 and 3-41-2).
5. Hardware: brass.\*

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D. Mechanical Equipment:

1. Movable gates--Roller type: four 5-foot submersible Roller gates, 80 by 20 feet, operating on tooth track and chain driven hoist machinery. Drawing numbers 3--40-2, 3-47-D, 3-47-1, 3-47-2, 54-A-1, 54-A-2, and 54-A-7.
2. Movable gates--Tainter type: none.
3. Lighting: fixtures as of time of installation, ca. 1935. Rewiring may have taken place over the years--extent is unknown.\*

E. Other Elements:

1. Earth dikes: linear non-submersible dikes with riprap revetment in some instances topped with a clay and gravel road. Earth dikes are located at the end of the movable dam section and extend to the north/northwest along the Wisconsin riverbank as well as south/southwest of the esplanade area on the Minnesota side. A protection dike of similar construction runs north and west from the Minnesota side dearth dike. Drawing number 3-52-26.
2. Roller gate bulkheads: temporary blocking units of structural steel girder construction placed in gate openings in period of emergency or repair. Drawing number 3-58-1.
3. Bulkhead car/tracks: car designed to store and access bulkheads. Located in storage yard. Drawing number 3-58-7.
4. Flatcar assembly: car for the transport of gate bulkheads and repair materials. Drawing number 3-58-10.
5. Movable crane: vertical lift crane (replaced ca. 1980) used for the moving of parts and equipment. Operates on track system attached to girder spans. "C" type original unit. Drawings of replacement unit available from St. Paul District Office. Drawing number 3-57-1.
6. Storage yard: area surrounding the last Roller gate pier on the Wisconsin side. Contains replacement parts for gates, bulkheads for track cars, and related repair items. Drawing number 3-53-4.
7. Boat launch: single-armed launch of metal construction. Installed ca. 1985.\*

#### PART IV. TECHNOLOGICAL INFORMATION--ESPLANADE AREA

##### A. Description of Esplanade--General Layout

1. Design character: standardized park/service area component. The esplanade area was originally designed to accommodate the central control station, lockkeeper's and assistant lockkeeper's residences, parking, and other service-related functions. Major site alterations have occurred since that time and are noted in the following items. Drawing numbers 3-38-11 and 3-38-17.
2. Historic landscape design: based on standardized designs--see drawings for esplanade and lockkeepers' residences. Drawing numbers 3-38-11 and 3-38-17.

##### B. Condition of Site and Structures: Altered.

1. Central control station--exterior: standardized construction. Hip roof; concrete stucco finish. Drawing number 3-70-1.
  - a. First floor: contains central control panel and room, bathroom, main office, and basement stairway access. Drawing numbers 3-70-1, 3-70-2, and 3-70-5.
  - b. Basement: contains storage and equipment rooms. All interior finishes altered from original construction. Drawing numbers 3-70-2 and 3-71-1.
2. Lockkeeper's/assistant lockkeeper's residences: standardized Colonial Revival with side porch. The structures have been moved off site to locations on Goodhue (Minnesota) County Road 18. Drawing number 3-10-40.
3. Outbuildings: various sheds and service buildings have been erected from time to time as demands required. None have particular significance or contribute to the site.

#### PART V. SOURCES OF INFORMATION

- A. Original Architectural Drawings: St. Paul District Office, Construction Drawings--Nine-Foot Channel Project 1027-1984. Passim.
- B. Early Views: Construction Photographs: Lock and Dam 3--Photograph Log Books
- C. Interviews: Personnel, Lock and Dam 3

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D. Bibliography:

1. Primary and unpublished sources: National Archives, Record Group 77; Construction Histories--Lock and Dam 3; see bibliography in MN-20
  2. Secondary and published sources: see bibliography in MN-20
- E. Likely Sources Not Yet Investigated: National Archives, Record Group 77, Suitland, Maryland; St. Louis, Missouri
- F. Supplemental Material: Aerial Photographs, U. S. Army Corps of Engineers, St. Paul District.